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Vibrational Behavior of Cylindrical Shells in Axial Magnetic Field

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Abstract : The investigation of the vibrational character of magnetic cylindrical shells placed in an axial magnetic field has important practical applications. In this work, we study the vibrational behaviour of such a cylindrical shell by making use of the so-called exact space treatment, which does not assume any hypothesis. We discuss the effects of several practically important boundary conditions on the vibrations of the described setup. We find that, for some cases of boundary conditions, e.g. clamped, simply supported or peripherally earthed, as well as for some values of the wave numbers, the vibrational frequencies of the shell are approximately zero. The theoretical and numerical exploration of this fact confirms that the vibrations are absent or attenuate very rapidly. For all the considered cases, the imaginary part of the frequencies is negative, which implies stability for the vibrational process.

Keywords : bending vibrational frequencies, exact space treatment, free vibrations, magnetic cylindrical shells
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